Effectiveness of the Mediterranean Diet and Lifetime Risk Reduction of Alzheimer Disease

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Abstract

Objective: Determine if a significant clinical correlation exists between adherence to a Mediterranean Diet and decreased lifetime risk of Alzheimer disease in non-demented adults 60-80 years old.

Design: Systematic literature review.

Methods: Searches were done in PubMed using MESH terms cognitive decline, low fat diet, Mediterranean, and prevention; in PubMed the following limits and terms were applied: published in the last 12 years, humans, English; excluding meta-analyses and systematic reviews.

Results: The systematic review yielded four studies: a randomized control trial completed by C. Valls-Pedret et al. (2015), two prospective cohort studies by C. Feart et al. (2009) and N. Scarmeas et al. (2006), and a cross-sectional observational study by R. Roberts et al. (2010).

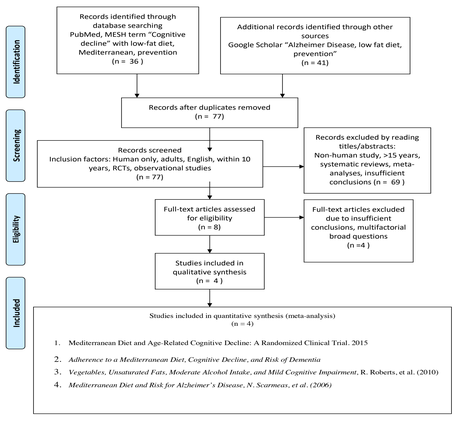
Conclusion: The studies evaluated by this paper find a significant correlation between a high-adherence to the entire Mediterranean Diet and decreased incidence of Alzheimer Disease and cognitive decline, though further research is recommended.

Introduction

Alzheimer disease is the sixth leading cause of death in the United States, and is the third leading cause of death in the U.S. elderly population.[1] It is the most common form of dementia, and is a progressive irreversible disease with high economical and psychological. Alzheimer disease is thought to be caused by pathological deposits of amyloid beta plaques and neurofibrillary tangles in the cerebral cortex, hippocampus, and amygdala.[2] The neurological changes lead to clinical presentations of declarative episodic memory loss, deficits in executive functioning, and behavioral changes.[3] Due to the incidence, high mortality and morbidity, and absence of cure of Alzheimer disease, a clinical focus must be made on prevention.

Recent studies have focused on the use of the Mediterranean Diet (MeDi) and a correlated decreased lifetime risk of developing Alzheimer disease and other age-related dementias. The MeDi diet incorporates high consumption of foods such as olive oil, vegetables, fruits, legumes, nuts, fish and seafood, moderate consumption of red wine, dairy, eggs, and poultry, and minimizes consumption of red meat and sugar.[4] This diet has been correlated with improvements of cardiovascular health and malignancy prevention, however impact on cognitive decline has not yet been proven. This study analyzes one randomized control trial, two prospective cohort studies, and one cross-sectional observational study—aiming to determine if a significant clinical correlation exists between adherence to a MeDi diet and decreased lifetime risk of Alzheimer disease of adults ages 60-80 years of age.

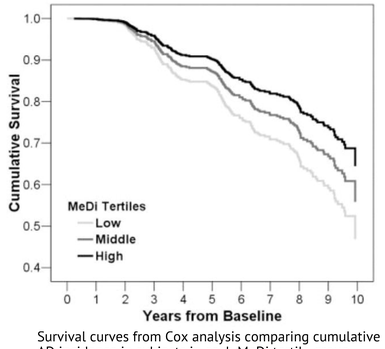
Methods



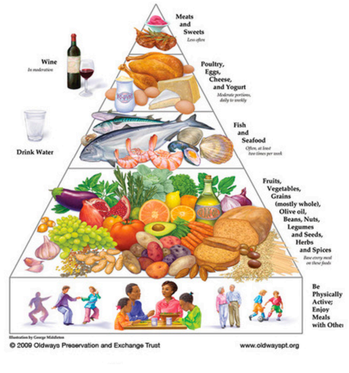
Results

Study	Valls-Pedret, et al	C. Feart, et al	R. Roberts, et al	N. Scarmeas, et al
Patients, N	447	1410	2719	2258
Type of Study	RCT	Prospective cohort	Cross-sectional	Prospective cohort
Population	Males and Females 55-80 years at high risk of CVD	Males and Females >65 at high risk of dementia	Males and Females 70-89 years	Males and Females enrolled in Medicaid in NY, USA. Mean age 77.6
Length	6 years (mean 4.1)	7 years	N/A	0.2-19.19 years
Study Objective	Investigate whether MeDi supplemented with antioxidant-rich foods influences cognitive function compared with a control diet	Association of MeDi with change in cognitive performance and risk for dementia in individuals over the age of 65.	To investigate associates of the MeDi diet components and the MeDi score associated with Mild Cognitive Impairment (MCI).	Investigate an association between the MeDi and decreased risk of Alzheimer Disease
Study Results	MeDi with olive oil or nut supplementation resulted in decreased cognitive decline.	Higher MeDi adherence correlated with slower MMSE cognitive decline.	Higher MeDi adherence was associated with decreased odds ratio of MCI and amnestic-MCI.	High adherence to MeDi correlated with a 40% decreased risk of developing AD.

- **Study #1 Critique:**
  - **Strengths:** RCT, the use of objective biomarkers, the use of comprehensive battery exams to determine cognitive functions
  - **Limitations:** Small sample size, hard to interpret what part of the diet impacted cognition.
- **Study #2 Critique:**
  - **Strengths:** population-based design, the sample size, and control for several potential cofounders like the including and excluding criteria
  - **Limitations:** Non-diverse population, the use of sex-specific cutoff points, short follow up, no definite association amongst Medi diet and incidental dementia
- **Study #3 Critique:**
  - **Strengths:** Randomly selected sample, multi-person clinical evaluation, preliminary longitudinal associations
  - **Limitations:** Cross-sectional design, recall bias
- **Study #4 Critique:**
  - **Strengths:** Thorough and blinded clinical evaluation, multiple stratifications of data analysis, multiethnic community population
  - **Limitations:** Did not stratify cardiovascular risk factors as confounders, possible recall bias, unclear lifetime risk reduction due to short follow-up



Survival curves from Cox analysis comparing cumulative AD incidence in subjects in each MeDi tertile group. Corresponding to low, middle, or high diet adherence.[8]



Discussion

- The four study objectives are very similar, using cognitive evaluations by neurologists and neuropsychologists to evaluate a correlation between the Mediterranean Diet and prevention of cognitive decline.
- The outcomes of the studies are supported by each other, with an overwhelming conclusion that a higher adherence to the entire MeDi correlates with a reduced risk of AD incidence and MCI in followed subjects.
- The smallest study, Valls-Pedret, is weak in its sample size but is also the only randomized control trial on the topic of AD and MeDi, which gives it more causality strength in its conclusion.
- Due to study type and design, the studies done by C. Feat, R. Roberts, and N. Scarmeas can only make significant correlations rather than causation.
- The implementation and evaluation of MeDi is very difficult to maintain, especially with the food questionnaires used by C. Feat, R. Roberts, and N. Scarmeas and the likely presence of recall bias.
- Possible limitations:
  - Time-consuming MeDi meal preparation and economic cost
  - Practical and realistic problem with elderly patients who may not be solely responsible for preparing his or her own meals
  - The moderate intake of red wine may pose a problem for those with a history of alcoholism, liver disease, or a religious or personal beliefs prohibiting alcohol consumption
  - Uncertain benefits with earlier implementation of diet before the age of 60
- A high-adherence to the MeDi diet should be recommended and considered in adults over the age of 55.
- Further investigation be made on this topic to include a larger population size, more diverse age groups, and randomized control trials.

Conclusion

The results of this study suggest that in an older population a high adherence to the Mediterranean diet may protect against Alzheimer Disease and other age-related cognitive decline. Although current research lacks causative evidence of how immensely the MeDi benefits individuals, the positive aspects of our findings cannot be ignored because of the lack of cure of neurodegenerative disease.

The lack of effective treatments for cognitive decline and dementia point to the need of preventive strategies to delay the onset and minimize the effects of these devastating conditions. It is unclear which parts of the diet may protect cognitive function, or how strong the correlation is between diet and decreasing incidence of lifetime risk of neurodegenerative disease; however, the recent findings convey some likelihood of the disease reduction process. The present results of implementing a Mediterranean diet are strongly encouraging, but further investigation is warranted.

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